Journal of Racial and Ethnic Health Disparities
https://doi.org/10.1007/s40615-018-0509-7

Strange Harvest: a Cross-sectional Ecological Analysis of the Association Between Historic Lynching Events and 2010–2014 County Mortality Rates

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Received: 19 March 2018 / Revised: 5 June 2018 / Accepted: 19 June 2018

Abstract

Background While the causes of lynching, a violent expression of racism, have been explored, little research has addressed the long-term consequences of this phenomenon. We examined the associaton between living in a county with a history of lynching and contemporary mortality rates within Southern US states.

Methods County-level data for lynchings between 1877 and 1950 were available for 1221 counties. Lynching rates were standardized to the 1930 population. Age-adjusted mortality rates were aggregated over 2010–2014 to allow sufficient observations in small counties. Multivariable linear regression examined the association between lynching rate categories and mortality while holding other county characteristics constant.

Results Overall age-adjusted mortality ranged from 863 deaths per 100,000 persons in counties with no recorded lynchings to 910 in the highest lynching rate counties ($p < 0.000$). In adjusted models, living in the highest versus lowest lynching category was associated with 34.9 (95% confidence interval 13.3–56.7) additional deaths per 100,000 per year for white males, 23.7 (95% CI 7.48–40.0) deaths for white females, and 31.0 (95% CI 3.6–58.4) deaths for African American females. No association was found for African American male death rates (31.3; 95% CI − 13.6 to 76.1).

Discussion The mechanisms through which historic lynching events might be associated with contemporary mortality rates are not clear. We advocate further research into structural characteristics of counties that may influence such disparities.

Keywords Social determinants of health · Minority health · Population health

Abbreviations

CI	Confidence interval
CDC	Centers for Disease Control and Prevention
EJI	Equal Justice Initiative
ERS	Economic Research Service, a branch of the US Department of Agriculture
NAACP	National Association for the Advancement of Colored People
RWJ	Robert Wood Johnson Foundation

Introduction

Lynching has a long, unfortunate history in the USA. "Lynching" differs from murder and other forms of interpersonal violence [1]. By definition, lynching is an unpunished murder. Key elements of the concept are mob violence, defined as three or more persons, rather than individual action, and the lack of community sanctions toward mob participants [1]. The lack of local punishment led the NAACP to recommend, unsuccessfully, that lynching be categorized as a federal offense [2].

The phrase "unpunished murder" does not adequately convey the extreme violence that generally accompanied lynchings in the southern US states. The common image of a hanged individual surrounded by a white crowd portrays an

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Published online: 25 July 2018

almost calm death scene [3]. Extensive torture frequently preceded the eventual death, and mutilation of the body by the assembled crowd was expected [4, 5]. Of note, photographs of lynching victims and the perpetrators were circulated as a way of disseminating the event's terror message more broadly [5].

The causes of lynching have been explored multiple times by sociologists and historians, with most concluding that a mix of political and economic pressures was associated with its occurrence. Politically, lynching has been characterized as a means to maintain white supremacy by terrorizing the African American population, while simultaneously expressing the solidarity of white residents across class and geographic regions [6–8]. Lynching rates have also been associated with economic downturns [9], although it is argued that economic challenges alone are insufficient without political motivations [10].

Research suggests that the legacy of lynching is associated with multiple contemporary phenomena, from segregated housing patterns [11] to differential incarceration rates [12]. Our research explores the association between a history of lynching within a community and the community's 2010–2014 mortality rates. Our overall hypothesis is that the social environment that allowed lynching—a violent, public form of murder with no consequences for the murderers—may be associated with institutions that differentially serve white and black citizens. Responding to prior suggestions that quasi-experimental research designs are needed to explore such effects [13], we used county-level mortality data to see if black mortality rates differed based on historic lynching rates.

Conceptual Framework for the Current Effects of Historic Events

Our approach falls within the socio-ecological model, with emphasis on the ongoing relationships among groups within the larger society across time. Our conceptual use of a socio-ecological approach builds on the call by McMichaels to expand the search for influences on population health beyond the "present and recent past" (p. 894) by adding a consideration of historic context [14]. McMichaels suggested that analyses using a socio-ecological model (middle pane, Fig. 1) fall short of capturing the full processes influencing health if these analyses fail to consider time. Our work also parallels analyses of the association of a history of segregation laws ("Jim Crow") with excess black mortality conducted by Krieger and associates [15, 16], who placed their work within an ecosocial approach [17].

Within the socio-ecological model, lynching is conceptualized as a community-level effect, a means once used by a white majority population to retain its dominance over and separation from minority populations [11]. Communities which once experienced racial conflict leading to lynching, and in which minority communities lack sufficient political power to push back, will continue to manifest this conflict across time, although through different mechanisms [12]. The temporal continuity of this community-level effect is supported by research documenting that communities which once expressed conflicts through lynching, versus communities that did not, remain more likely to express race-based conflict through higher residential segregation [11], segregation of white children into private academies [18], higher homicide rates [19], reduced compliance with hate crime laws [20], differential incarceration of African Americans [21], and the frequency of death sentences [22], although evidence for the latter is mixed [23].

It should be noted that lynching could also fit within the "historic trauma" model, which has been proposed as a source of racial-ethnic disparities in health [24]. In this model, trauma experienced by a generation experiencing subjugation is passed down to subsequent generations, with ongoing health effects through psychological and physiological responses to stress [13]. A private history of lynching, shared among African American populations, has been suggested as a reason for underlying distrust of majority institutions, with adverse effects on health and social outcomes [5]. Historic trauma theory has been criticized, however, for conceptualizing the intergenerational transmission of trauma within the disadvantaged group itself, neglecting issues of ongoing socio-economic and political disadvantage [25]. The socio-ecological model, which nests the individual within interpersonal, community, and societal structures, avoids placing the onus for disparities upon the disadvantaged groups while still allowing for consideration of the role of historical influences.

Using the socio-ecological model, we posit that in communities where lynching was once prevalent, the social determinants of health would be more unequally distributed than in other communities, to the disadvantage of minority populations. In addition, the health of black residents would be adversely affected by racial stress, through the mechanism of adverse allostatic load [13]. Thus, we hypothesize that county-level black mortality rates will be associated with county-level historic lynching rates.

Method

Design and Population

We conducted a cross-sectional analysis of age-adjusted county-level mortality rates for the 12 southern states contained in the Equal Justice Initiative (EJI) lynching data base: Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Texas, and Virginia. The EJI has compiled a database of lynching incidents geographically tied to current county boundaries [26]. In total, the 12 studied states contain 1224 counties. Two rural

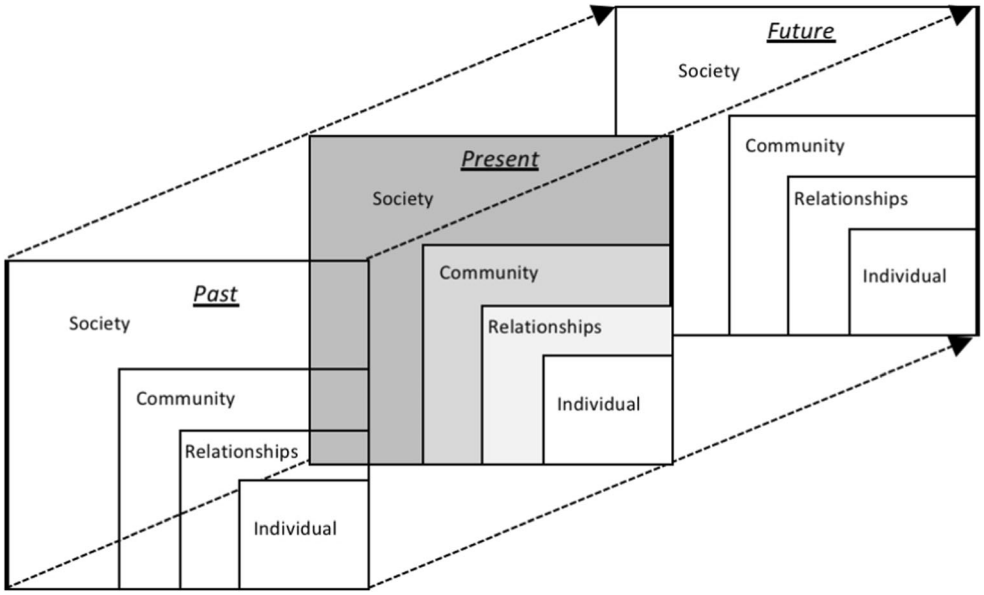

Fig. 1 The socio-ecological model viewed as an historical process

counties in Texas could not be included because extremely low populations precluded calculation of 5-year mortality rates, leaving an initial study population of 1222 counties. Because this research used publicly available data at the county level, this study was deemed exempt by the University of South Carolina Institutional Review Board.

Independent Variable: Population-Adjusted Rate of Historic Lynching

The EJI defined lynching as killings of African American citizens by a group of three or more perpetrators, documented in local newspapers, but for which no criminal prosecution was documented. This definition parallels the historic definition used by the NAACP. The EJI identified 4075 lynchings between 1877 and 1950. The EJI, as noted, geographically located events within current county boundaries. Other commonly used sources for lynching research include the database compiled by the NAACP [27], an index compiled from local newspapers [8], and the Historical American Lynching Data Collection Project [28]. We chose the EJI list because it is the most recent, included all of the southern states, and located historic lynchings within current county boundaries.

The number of lynchings in each county in the 12 studied states varied. Many counties (446, 36%) had no recorded lynchings; the highest value was 244. Previous research has either used count data grouped into quartiles [19] or calculated rates adjusted for total population [12, 22]. Using the latter approach, we standardized rates across different counties by dividing the total number of lynchings by the total county population in 1930, yielding deaths per 10,000 population. We chose 1930 because many modern counties were incorporated in the early twentieth century, and we lacked resources to allocate populations from earlier census years, such as 1910, to current county boundaries. The year 1930 yielded all modern counties in the studied states. We chose total population, rather than black population alone, based on previous research [12, 22]. Even when standardized based on population, lynching rates in counties with any events varied markedly, from 0.03 to 60.00 per 10,000 residents, with a non-normal distribution. We thus grouped lynching rates into four categories for analytic purposes: zero lynchings, and an approximate tercile distribution among counties in which one of more lynchings had occurred, for four groupings (0 or no lynchings; > 0 through 0.94 per 10,000; > 0.94 through 2.51/10,000; and > 2.51/10,000).

Dependent Variable: Age-Adjusted Mortality Rates

County-level age-adjusted mortality rates were obtained from the CDC Wonder database, for five population groups: total county population, white males, white females, black males, and black females. The Wonder age-adjusted rates are standardized to the 2000 US population [29]. Mortality was calculated over the 5-year period 2010–2014, to allow sufficient observations for most counties. To avoid the use of unreliable estimates, mortality analysis was restricted to counties with at least 20 deaths across the 5-year study period [30]. This is a more conservative approach than that used by Leitner and associates, who excluded only counties with fewer than 10 deaths [31]. Age-adjusted total county mortality was available for 1221 counties; white male mortality for 1219 counties, white female mortality for 1217 counties; black male mortality for 888 counties, and black female mortality for 874 counties. Mortality rates were not transformed in any way for analytic purposes.

Other County Characteristics

To distinguish the effects of lynching from other factors associated with mortality, we included several county-level descriptors in the final analysis. County-level data were obtained from the 2012–2016 Robert Wood Johnson (RWJ) County Rankings data sets [32]. Basic population descriptors, averaged across the years 2010–2014, included percent unemployed, percent uninsured, high school graduation rate, median household income, and percent African American population (the latter for 2014 only, as this value was virtually unchanged in all years). County capacity indicators were primary care physician/population ratio (in quartiles; 2010–2014 data) and indicator variables for nonmetropolitan status and several county typology variables from the Economic Research Service (ERS), US Department of Agriculture. ERS typology codes were used to capture long-term economic deprivation and the presence of hazardous industries. ERS updates these codes after each decennial census; we used the 2010 categories. Typologies were persistent poverty county, population loss county, farming county, mining county, and manufacturing county [33]. The final economic variable was income disparity based the ratio of the top 20% to the bottom 20% of income in the county.

Three community-level social capital variables were used, as social capital has been suggested as a possible mediator of the effects of racial bias [34]. Social capital can be conceptualized at either the individual or the community level [31, 35]. Applied to a community, as in the present analysis, social capital refers to the degree to which the community contains institutions that serve bonding (linking similar individuals within groups) and bridging (linking across groups) functions [36]. At the county level, community social capital has been inversely linked to self-reported health and premature death [37], opioid overdose deaths [38], late HIV diagnosis [39], and mortality [40]. However, the evidence is mixed [41], perhaps because varying definitions of the concept are used across studies. Community-level social capital information was obtained from the Northeast Regional Center for Rural Development, including county-level estimates for census response rate (2010), voter turnout (2008), and the number of associations per 10,000 residents (2009) [42].

Analytic Strategy

Analysis of variance was used for unadjusted comparisons of county characteristics and mortality rates across lynching categories. Ordinary least square regression analyses were used to examine the association between lynching categories and mortality while holding other factors constant. The four-level lynching variable was treated as a categorical variable, with all higher levels compared to the referent value of zero lynching. Community descriptor variables were transformed into z-scores for modeling. Reflecting the suggestion that the influence of the current proportion of African Americans in the population was related to outcomes in a curvilinear fashion (lowest in communities with a very low or very high African American population) [12, 22], the African American proportion of the community was entered as rate and rate(squared). All analyses were conducted using Stata with an alpha level of 0.05 [43].

Results

Description of Studied Counties

A map of lynching rates within studied states is provided as Fig. 2. At the state level, the mean number of lynchings per county across the 73-year period varied from 1.22 in North Carolina through 8.95 in Louisiana. Average county lynching rates per 10,000 residents ranged from 0.39 in North Carolina through 4.19 in Florida (data not in table) (Fig. 2).

Table 1 describes the current characteristics of counties studied, by lynching category (lowest to highest). Several population characteristics potentially associated with mortality were generally less favorable in higher lynching category counties compared to the zero lynching category counties (Table 1). Characteristics in which the all three lynching county groups differed from the zero lynching group included proportion of the population that identified as African American (higher in lynching than zero lynching counties), proportion of adults lacking health insurance (higher in zero lynching than in other categories), proportion of adults who had graduated from high school (higher in zero lynching than in other counties), average unemployment (higher among lynching than among zero lynching categories), and wealth disparity between the highest and lowest households (higher among all lynching categories than zero lynching counties). In comparisons across the ERS county typologies, zero lynching counties were more likely to be economically concentrated in farming and mining than were all other county categories. Other differences were significant for selected comparisons, as detailed in Table 1.

Unadjusted Association of Lynching Category with Mortality Rates

For all populations, mortality was higher in one or more of the lynching history categories than in the zero lynching group (Table 2). For overall and for black male and female mortality, average county mortality rates in each lynching category were higher than rates in zero lynching category counties. For white men and women, some but not all lynching category mortality rates differed from rates across zero lynching counties.

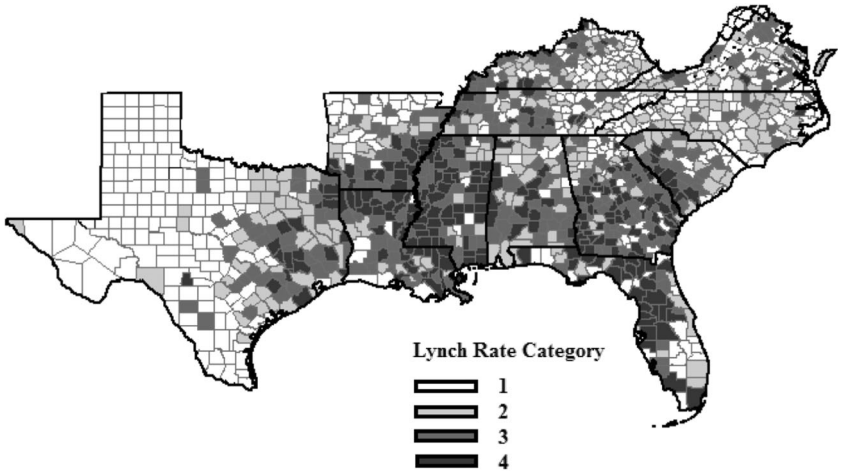

Fig. 2 Geographic distribution of studied counties, by lynching rate category, 12 US southern states. Category definitions: 1: no lynchings on record; 2: any through 0.934/10,000 residents; 3: more than 0.934 to 2.508/10,000 residents; 4: greater than 2.508 /10,000 residents

Adjusted Association of Lynching Category with Mortality Rates

Table 3 presents adjusted results for the relationship between lynching levels and mortality across the total population (Panel A) and by race/sex categories (Panels B and C), holding population and community characteristics equal. With the exception of black male death rates, historic lynching rates were positively associated with county-level mortality rates across all population groups studied. For black female and

Table 1 Characteristics of studied counties, by lynching rate category

	Category 1 $n = 446$ [1]	Category 2 $n = 256$ [1]	Category 3 $n = 263$ [1]	Category 4 $n = 257$ [1]	p value
Population characteristics					
Population, 1930	16,700	46,091	24,006	19,439	a, b
Population, 2015	50,281	175,447	62,052	78,901	a
Median household income, 2010–2014	41,953	41,039	41,273	38,713	c
African American proportion of population, 2014	8.3	18.6	21.2	30.2	a, b, c
Adult uninsurance rate, 2010–2014	25.7	24.0	23.7	24.8	a, b, c
Unemployment rate, 2010–2014	8.0	8.7	8.8	9.5	a, b, c
Percent high school graduates, 2010–2014	85.5	82.5	81.7	77.2	a, b, c
Income inequality ratio, 2010–2014	4.69	4.83	4.83	5.03	a, b, c
County characteristics					
Primary care providers per 100,000, 2010–2014	42.4	52.6	43.8	40.5	a
Percent of counties that are:					
Metropolitan	34.8	48.4	42.2	43.2	a, c
Persistent poverty	17.9	15.6	20.9	38.5	c
Population loss	11.4	5.1	8.7	12.8	a
Farming county	16.4	3.9	9.1	8.2	a, b, c
Mining county	16.6	3.9	4.9	3.1	a, b, c
Manufacturing county	14.3	21.9	23.2	19.8	a, b
Census response rate, 2010	69.0	72.7	70.3	66.1	a, c
Voter turnout, 2008	53.9	55.0	55.7	57.8	b, c
Association/population ratio, 2009	1.28	1.21	1.23	1.16	c

[1] Category definitions: 1: no lynchings on record; 2: any through 0.934/10,000 residents; 3: more than 0.934 to 2.508/10,000 residents; 4: greater than 2.508 /10,000 residents

p values indicate significant differences, as follows: a—category 2 is significantly different from category 1 at $p < 0.05$ or better; b—category 3 is significantly different from category 1 at $p < 0.05$ or better; c—category 4 is significantly different from category 1 at $p < 0.05$ or better

Table 2 Average age-adjusted all-cause mortality rates across studied counties, by lynching rate category, 2010–2014

Lynch rate category	Overall age-adjusted mortality ($N = 1221$)	5-year age-adjusted mortality rates for:			
		Black males ($N = 888$)	White males ($N = 1217$)	Black females ($N = 873$)	White females ($N = 1217$)
Category 1	863	1138	1014	784	739
Category 2	889**	1202**	1032	817***	747*
Category 3	905***	1218***	1041*	835*	761
Category 4	910***	1220***	1042*	827**	756

Category definitions: 1: no lynchings on record; 2: any lynchings through 0.934/10,000 residents; 3: more than 0.934 to 2.508/10,000 residents; 4: greater than 2.508/10,000 residents

p values indicate differences between the starred value and the value for category 1

*$p \leq 0.05$

**$p \leq 0.01$

***$p \leq 0.001$

white male and female rates, the two highest lynching categories differed from the referent group, no historic lynching; for total population mortality, all levels differed from the referent groups. Specifically, the difference between counties with no lynching history and those with the highest recorded rates was 32.68 deaths per 10,000 for overall mortality (95% confidence interval (CI) 16.09–49.28), 30.97 for black female mortality (95% CI 3.59–58.35), 34.94 for white male mortality (95% CI 13.32–56.56), and 23.68 for white female mortality (95% CI 7.48–39.89).

Additional population and community characteristics were also related to mortality rates. Median income was negatively associated with death rates across all groups studied; surprisingly, the adult uninsurance rate was also negatively associated with mortality across all population groups. The only other variable with effects in common across all groups was the association/population ratio, which was positively associated with mortality.

The varying numbers of counties with valid mortality data within each race/sex subgroup make comparisons of individual county characteristic effects across populations uncertain. For example, living in a mining county was significantly associated with mortality for white males, but not for black males. However, the number of mining counties included in the mortality analysis for white males was 104 of 1219 counties (8.5%), but only 35 of 888 counties (3.4%) for black males. Thus, it is possible that mining is equally hazardous for both groups, but the analysis lacks power to detect this effect among black males.

As shown in Table 2, the number of counties with valid mortality data, that is, ≥ 20 deaths over the 5-year period, varied from 1221 for overall population to 873 for black female mortality. To test that different findings within race/sex populations were not an artifact of the differing county groups included, we reran our fully adjusted analyses for total, white male and female, and black male populations on the smallest subset of counties, those used for the analysis for African American female mortality rates ($n = 873$). Findings for total population and for white men were largely unchanged; changes in coefficients were minor and the same relationships were statistically significant. For white women, the relationship between lynching category and mortality did not reach statistical significance in the smaller sample.

Discussion

We used a cross-sectional analysis of contemporary mortality rates to assess whether living in a county with a history of lynching would be associated with higher mortality rates among African American residents. This hypothesis was modestly supported. However, additional findings emerged: living in a county with a history of lynching, versus no such history, was associated with higher mortality rates for white populations. While white mortality rates were consistently lower than those of their African American counterparts, this relative advantage was somewhat lessened by living in a county with a history of racial violence.

For African American women, living in a county in the two higher lynching rate categories, versus none, was associated with current mortality, even after controlling for multiple population and community characteristics. The absence of an association between lynching rates and current mortality among African-American men in adjusted analysis was unanticipated. The simplest potential explanation is that this relationship is not present. County-level mortality rates for black men were consistently the highest of any group; with the exception of a distinction between counties that did/did not have lynching experience, rates did not vary markedly across levels of lynching in bivariate comparisons (Table 2). It is also possible that there is an association that our analysis failed to detect, given that our control variables were not generally race-specific. For example, our available data for median income pertained to all residents, rather than median income for African American households alone. Paralleling other work [44], our adjusted models were more effective at explaining variation in white than in African American mortality rates (see R square values in Table 3). An analysis that included race-specific levels of educational attainment, unemployment, and other determinants of health might have been more effective at explaining variation in mortality rates.

Table 3 County-level association between historic lynching levels and mortality, total, and by race and sex, 2010–2014 age-adjusted rates, adjusted for all characteristics shown

Panel A: overall county mortality

	Coefficient	95% confidence interval		*p* value
		Lower	Upper	
Lynching rate category (referent: category 1)				
Category 2	16.77	1.31	32.22	0.033
Category 3	29.34	13.92	44.76	0.000
Category 4	32.68	16.09	49.28	0.000
Population characteristics [a]				
Percent African American	− 0.33	− 0.82	0.16	0.188
Percent African American, squared	0.14	− 0.35	0.62	0.583
Unemployment rate	0.22	− 0.01	0.45	0.065
Median income	− 1.88	− 2.14	− 1.61	0.000
Adult uninsured rate	− 52.73	− 59.97	− 45.48	0.000
High school graduation rate	0.24	0.08	0.40	0.003
Income ratio	− 1.96	− 8.80	4.89	0.575
Community characteristics				
Primary care provider quartile	− 2.41	− 7.96	3.15	0.395
Metropolitan county	− 12.87	− 26.37	0.63	0.062
Persistent poverty	24.65	6.98	42.31	0.006
Farming county	0.96	−18.42	20.33	0.923
Mining county	60.28	38.48	82.08	0.000
Manufacturing county	19.27	5.18	33.36	0.007
Population loss county	29.20	9.40	49.00	0.004
Census response rate	7.46	0.48	14.44	0.036
Voting rate	− 20.23	− 27.80	− 12.66	0.000
Association/population ratio	10.10	3.32	16.88	0.004
Constant	857.19	836.02	878.35	0.000

Adjusted R^2 for model: 0.4883

Panel B: county-level black mortality rates

	County-level black male mortality rates				County-level black female mortality rates			
Overall mortality	Coefficient	95% confidence interval		*p* value	Coefficient	95% confidence interval		*p* value
		Lower	Upper			Lower	Upper	
Lynching rate category (referent: category 1)								
Category 2	39.43	− 3.30	82.16	0.070	25.34	− 1.01	51.68	0.059
Category 3	43.44	− 0.37	87.24	0.052	41.01	14.23	67.79	0.003
Category 4	31.25	− 13.59	76.09	0.172	30.97	3.59	58.35	0.027
Population characteristics [a]								
Percent African American	− 1.48	− 2.92	− 0.04	0.044	− 1.96	− 2.84	− 1.07	0.000
Percent African American, squared	0.85	− 0.45	2.16	0.199	1.35	0.56	2.15	0.001
Unemployment rate	− 0.10	− 0.77	0.56	0.758	− 0.65	− 1.06	− 0.25	0.002
Median income	− 1.88	− 2.63	− 1.14	0.000	− 1.13	− 1.58	− 0.68	0.000
Adult uninsured rate	− 32.99	− 55.68	− 10.30	0.004	− 19.10	− 32.97	− 5.23	0.007
High school graduate rate	0.18	− 0.33	0.69	0.484	0.34	0.03	0.64	0.032
Income ratio	45.97	25.63	66.30	0.000	10.62	− 1.79	23.03	0.093
Community characteristics								
Primary care provider quartile	− 3.43	− 19.55	12.70	0.677	6.00	− 3.76	15.76	0.228
Metropolitan county	− 32.52	− 69.89	4.84	0.088	− 37.62	− 60.57	− 14.67	0.001
Persistent poverty	− 8.19	−58.25	41.86	0.748	12.87	− 17.80	43.54	0.411
Farming county	84.85	11.43	158.28	0.024	− 16.88	− 62.02	28.26	0.463
Mining county	44.65	− 34.60	123.89	0.269	98.61	49.91	147.31	0.000

Table 3 (continued)

Manufacturing county	63.29	25.66	100.93	0.001	− 0.15	− 23.05	22.76	0.990
Population loss county	56.21	− 5.52	117.93	0.074	− 18.18	− 55.71	19.34	0.342
Census response rate	3.49	− 18.32	25.29	0.754	− 14.46	− 27.68	− 1.23	0.032
Voting rate	22.44	1.03	43.84	0.040	− 6.10	− 19.10	6.90	0.357
Association/population ratio	52.62	27.94	77.31	0.000	29.28	14.29	44.27	0.000
Constant	1175.30	1110.34	1240.26	0.000	798.39	758.95	837.82	0.000
	Adjusted R^2 for model: 0.2428				Adjusted R^2 for model: 0.2246			
Panel C: county-level white mortality rates								
Overall mortality	County-level white male mortality				County-level white female mortality			
	Coefficient	95% confidence interval		*p* value	Coefficient	95% confidence interval		*p* value
		Lower	Upper			Lower	Upper	
Lynching rate category (referent: category 1)								
Category 2	17.04	− 3.08	37.16	0.097	9.53	− 5.55	24.61	0.215
Category 3	26.55	6.46	46.63	0.010	20.10	5.04	35.15	0.009
Category 4	34.94	13.32	56.56	0.002	23.68	7.48	39.89	0.004
Population characteristics [a]								
Percent African American	− 0.73	− 1.36	− 0.09	0.026	− 0.15	− 0.62	0.33	0.550
Percent African American, squared	− 0.18	− 0.81	0.45	0.573	− 0.38	− 0.85	0.09	0.113
Unemployment rate	0.17	− 0.13	0.48	0.270	0.27	0.04	0.49	0.023
Median income	− 2.36	− 2.71	− 2.02	0.000	− 1.43	− 1.69	− 1.17	0.000
Adult uninsured rate	− 65.86	− 75.31	− 56.41	0.000	− 47.12	− 54.24	− 40.00	0.000
High school graduate rate	0.31	0.10	0.52	0.004	0.15	− 0.01	0.31	0.062
Income ratio	− 5.86	− 14.78	3.05	0.197	− 10.76	− 17.46	− 4.07	0.002
Community characteristics								
Primary care provider quartile	− 3.48	− 10.71	3.76	0.346	− 4.50	− 9.93	0.93	0.104
Metropolitan county	− 11.23	− 28.85	6.39	0.212	− 12.33	− 25.56	0.90	0.068
Persistent poverty	34.05	11.04	57.06	0.004	21.31	4.05	38.58	0.016
Farming county	− 8.60	− 34.01	16.82	0.507	14.89	− 4.30	34.07	0.128
Mining county	63.41	35.02	91.80	0.000	58.47	37.09	79.85	0.000
Manufacturing county	19.56	1.22	37.91	0.037	20.05	6.30	33.81	0.004
Population loss county	49.71	23.79	75.64	0.000	23.98	4.47	43.49	0.016
Census response rate	8.28	− 0.84	17.41	0.075	1.46	− 5.42	8.34	0.677
Voting rate	− 28.26	− 38.15	− 18.37	0.000	− 26.11	− 33.56	− 18.66	0.000
Association/population ratio	9.61	0.67	18.54	0.035	6.92	0.21	13.64	0.043
Constant	995.48	967.86	1023.10	0.000	731.76	711.03	752.49	0.000
	Adjusted R^2 for model: 0.4388				Adjusted R^2 for model: 0.3847			

Category definitions: 1: no lynchings on record; 2: any lynchings through 0.934/10,000 residents; 3: more than 0.934 to 2.508/10,000 residents; 4: greater than 2.508 /10,000 residents

[a] All population characteristics are expressed as standardized z scores

Understanding how historic lynching may be associated with white mortality remains problematic. It may be that a lynching history is associated with higher levels of current race-based prejudice among white residents. Previous research using voluntary assessment of personal racial bias found that both white and black death rates from circulatory disease and overall mortality were positively associated with bias rates in the community [13, 41]. While being the target of race-based bias is the more severe condition, bias also has a cost for the dominant population.

While research has demonstrated the proximate effects of racism on health [45, 46], explanations that focus on the person ignore the place of individuals within communities over time, as specified in the socioecological model. The population ratio of racially motivated behaviors with the evolution of community structures and resources may be the more valuable research topic. With reference to the past, research into the causes of lynching found this behavior to be strongly associated with economic conditions and racial conflict [9, 12]. Looking at present day community-level effects, a history of lynching has been associated with discrimination in housing [11], schools [18], and the criminal justice system [21–23], as well as with the mortality effects reported here. If we are going to alter the patterns of community racism to change future outcomes, however, we need to expand our research focus.

Racism needs to become a dependent variable in epidemiologic and health services research, rather than a predictor. Future community-level analyses should address both historic and current predictors of racist attitudes, to identify structural points of change. Public health interventions addressing health disparities will not succeed unless these interventions acknowledge, and where possible address, institutional barriers [47].

As an observational analysis, our study contains multiple limitations. First, the data on lynching draws from material compiled by the Equal Justice Initiative from archival sources. It is likely that additional events were known within local communities, but not reflected in public sources, such as newspapers. The amount of bias introduced by under-reporting cannot be estimated. Second, our research does not identify counties in which a threatened lynching was avoided. The kill rates of "mob formation events" in three states were estimated to range from 85% in Mississippi to 50% in North Carolina [7]. Successfully deterred lynchings, even when the intervention only delayed the subsequent legal execution of the accused, may represent a level of community recognition of the appropriateness of the rule of law, or insufficient political power on the part of the lynching faction. Either interpretation suggests the likelihood of more equitable community institutions. Future research that includes all levels of response to mob violence is needed. Third, our analysis treats counties as independent units. Spillover associations of a lynching in one county to a nearby community were not explored, although research into the occurrence of lynching suggests that these events had some spatial correlation [48]. Fourth, the list of covariates chosen to account for factors other than lynching that may be associated with mortality rates may be inadequate. Finally, mortality itself is a blunt measure that is affected by myriad influences across the life course [15]; measuring mortality at the county rather than the individual level exacerbates this problem.

Written in 1937, the poem "Strange Fruit," later sung by Billie Holiday, memorialized the lynching of blacks in the South [49]. Our research suggests that a local culture that once permitted lynching may be associated with long-term differences in current health: strange fruit yields strange harvest, among both black and white populations. Ironically, a white southern writer may have summarized the problem best: "The past is never dead. It's not even past." [47]. While we cannot change the past, we can identify key problems and work to change the future. These words from Dr. Martin Luther King Jr. remain relevant:

> It really boils down to this: that all life is interrelated. We are all caught in an inescapable network of mutuality, tied into a single garment of destiny. Whatever affects one directly, affects all indirectly [50].

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical Approval This research was reviewed by the Institutional Review Board of the University of South Carolina and categorized as "Not Human Research" under the Code of Federal Regulations (45 CFR 36).

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